THE EFFICACY OF EDUCATIONAL INTERVENTIONS FOR SELF-MANAGEMENT OF ASTHMA IN CHILDREN – LITERATURE REVIEW

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BY

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ABSTRACT

RESEARCH PROJECT: The efficacy of educational interventions for self-management of asthma in children.

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The purpose of this research paper was to explore the effectiveness of educational interventions for children with asthma by identifying key components and reported efficacy of asthma self-management educational interventions for children in reduction of school absenteeism and emergency room (ER) visits. A matrix was developed to review the literature by the student and her advisor. The results found that some of the key components of the studies were multiple interventions performed, direct education to the child and/or caregiver, addressed other areas outside of medicine regimen of asthma, use of community representatives, reduction of environmental factors, and being culturally relevant. A total of two studies met the criteria for reported efficacy of asthma self-management educational interventions for children in reduction of school absenteeism. The last set of data reviewed was the reported efficacy of asthma self-management educational interventions for children in reduction of ER visits. Four interventions were used. One study found that adherence of medication intervention included asthma education and helped to make a significant reduction in ER visits. Further research of the topic areas for educational interventions for children with asthma is recommended.

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CHAPTER ONE

THE PROBLEM

Introduction

Asthma is a highly prevalent disease throughout the world. Asthma is a chronic disease found in 235 million people worldwide (World Health Organization [WHO], 2011). It is known to be the most common disease in children (WHO, 2011). Asthma related deaths occur more in poorer countries but it is a public health concern not only for the poorer countries but also the higher income countries (WHO, 2011). There are many ways to be at risk for asthma but not all people develop it. The strongest risk factors are environmental factors that are inhaled, provoke allergic reactions, and irritate the airways such as dust mites and environmental tobacco smoke (WHO, 2011). Taking daily medications (if prescribed) can help control asthma. Also, reducing the environmental triggers and irritants can help reduce the severity of asthma (WHO, 2011). When asthma is undetected and untreated, it creates a burden on the person with asthma and his or her family, reducing the person with asthma and their family's quality of life (WHO, 2011). Using appropriate self-care for asthma can help improve the quality of life for those with asthma and their families (WHO, 2011).

In the United States, the number of adults living with asthma is 18.7 million (Centers for Disease Control and Prevention [CDC], 2011). In addition, seven million children are

living with asthma in the United States (CDC, 2011). Four million children with asthma have had asthma exacerbations in the past 12 months (Akinbami, Moorman, & Liu, 2011). Out of the 12.8 million total numbers of people who had exacerbations, children make up approximately a third of this category (Akinbami et. al., 2011). Individuals in this group are also more susceptible to adverse conditions such as ambulatory care i.e. emergency room visits or hospital inpatient care (Akinbami et. al., 2011).

In 2002-2007, the total incremental cost of asthma per year has been estimated at $3,259 per person (Barnett & Nurmagambetou, 2011). During that same timeframe, the estimated incremental cost per person for hospital visits resulting in outpatient care was $151, $110 for emergency room visits, and visits that required a hospital stay were estimated at $446 (Barnett & Nurmagambetou, 2011). Medications make up the biggest part of the estimated incremental cost for asthma at $1680 per a year (Barnett & Nurmagambetou, 2011). In students, absenteeism due to asthma made led to a loss of 0.92, days per academic year (Barnett & Nurmagambetou, 2011). Asthma is accountable for 98% increase in absenteeism from school (Barnett & Nurmagambetou, 2011). The total estimated cost for the burden of asthma in 2007 was $56 billion (Barnett & Nurmagambetou, 2011).

There are also huge disparities within the populations of people with asthma (Akinbami et. al., 2011). Children have a higher prevalence of asthma over adults (Akinbami et al., 2011). Although women have a higher prevalence of asthma than men, in children, boys have a greater occurrence than girls until adolescence when females begin to have a higher prevalence of asthma (Akinbami et. al., 2011). In minority groups,

African-Americans have a higher rate of asthma than whites (Akinbami et. al., 2011). In addition, the Puerto Rican population has a higher incidence of asthma in comparison to non-Latino Blacks or non-Latino Whites (Akinbami et. al., 2011). Some of the other characteristics associated with groups who have a higher prevalence of asthma in the US are being poor (household income lower than federal poverty line or near poor) as well as living in the Northeastern or Midwestern parts of the US (Akinbami et. al., 2011).

Children are diagnosed and manage this disease without being given the proper self-management tools (Deaves, 1993). According to the National Heart, Lung, and Blood Institute (NHLBI) national guidelines for asthma diagnosis and treatment also known as the Expert Panel Report 3 (EPR 3), there are four main components a healthcare provider should implement to help ensure a successful asthma self-management program for the patient which are: 1) Assessing and monitoring asthma severity and asthma control, 2) Education for a partnership in care. 3) Control of environmental factors and comorbid conditions that can affect asthma, and 4) Medications (2007, pp. 27-42). Educational interventions can play a critical part in meeting the national guideline components for a successful asthma management plan.

A major part of asthma control also lies with the patient and/or caregiver being able to implement a successful self-management plan. Therefore, knowing the effectiveness of educational interventions focused on children with asthma can be helpful in order to measure the success of an asthma self-management plan. It is important for children to develop proper self-management tools early in life in order to ensure a successful asthma

control plan later in life. Also, adolescents should have good self-management tools in order to manage their asthma as they gain more independence.

Using the guidelines set by NHLBI (2007) can help make certain that children along with their caregivers will have successful asthma self-management programs. Asthma can be a manageable disease for all age groups. Therefore, knowing the key components and efficacy of educational interventions targeted to children with asthma will help make the healthcare community aware of the best ways to reach this targeted population for asthma education and control.

Statement of the Problem

Asthma self-management skills are essential for children to have proper asthma management and control. Multifaceted asthma interventions are needed for proper asthma care. However, more research is needed to know which asthma interventions are most effective in helping children to control their asthma. The purpose of this research paper was to identify the key components and efficacy of educational interventions for children with asthma by looking at the outcome measurements of school absenteeism and emergency room visits.

Purpose of the Study

The research was conducted in order to identify relevant data on the key components and efficacy of educational interventions for children with asthma by looking at the reduction of school absenteeism and emergency room visits. This study can be an asset to many groups of people related to asthma self-management programs. Healthcare

professionals can use this research as a guide to know the best ways manage asthma in children. Also, this research can serve as a single source to gather such information instead of having to review individual research studies. Finally, there is unclear data on the key components and efficacy of children with asthma educational interventions. The resulting compendium of recent information will inform healthcare providers, affiliates, and encourage partnerships with patients and their caregivers (if applicable) in asthma management. If results show that there are key components of educational interventions, practitioners can use these items in practice to begin or enhance their intervention for children with asthma. If results show that there are no key components of educational interventions, then this research can play a strategic role in helping educators and researchers to develop key components that are effective in educational interventions.

Delimitations

This study was delimited by the following:

1. Selective data bases were used-CINAHL [Cumulative Index to Nursing and Allied Health Literature], ERIC (EBSCOHost), Health Source: Nursing/Academic Edition, Medline (EBSCOHost), ProQuest Nursing and Allied Health Source, and Web of Science.
2. The use of Dissertations and Theses accessed by Ball State University Library via ProQuest Dissertations and Theses A& I.
3. Years used: 1990-2011.
4. Used peer reviewed articles in the context of the following: asthma and interventions.

5. Key words used to search the data were: educational interventions
6. All searches were coupled with key phrases “asthma”
7. All publications were in English and US based.
8. The age group of children included was 2-17 years old with asthma.
9. Studies with comorbidities of other lung diseases were excluded.
10. The outcome variables had to relate to outcome variables measured (key components of an educational intervention, reduction of emergency room visits, or reduction of school absenteeism).
11. The research was conducted using Ball State University library resources.
12. All studies for the outcome variable of school absenteeism and emergency room visits were randomized controlled trials.

Limitations

The limitations to this literature review are as follows:

1. Limitation of professional journals accessible on the available databases used.
2. Number of subjects in studies.
3. Years used in literature review.
4. Limited or no information is given on survey instruments.
5. Using BSU library services may not have access to all databases and articles available on the subject.
6. Using US based and English journals.
7. Using children aged 2 – 17 years old.

8. Limited studies that focused only on asthma as a respiratory disease.
9. Selecting three outcome variables to review.

Assumptions

This study was based upon the following assumptions:

1. Scholarly literature reviewed was presented in an unbiased and accurate manner.
2. Educational interventions for children with asthma were published in a peer reviewed journals.
3. The literature used proper research methods.
4. The instruments/tools used in the research were valid and reliable.

Research Questions

Research questions identified were as follows:

1. What are the key components of asthma self-management educational interventions for children?
2. What is the reported efficacy of asthma self-management educational interventions for children in reducing school absenteeism?
3. What is the reported efficacy of asthma self-management educational interventions for children in reducing emergency room visits?

Definition of Terms

Terms pertinent to this study were defined as follows:

1. Children-For the purposes of this study, children were persons, school-aged or less than 18 years of age.

2. Educational Intervention- For the purposes of this study, an educational method used to reduce the burden of asthma symptoms or improve the quality of life for those with asthma.
3. Key components-For the purposes of this study, major findings that proved to be successful in an asthma educational self-management intervention.
4. Self-management-For the purposes of this study, the ability to manage or control one's own chronic condition successfully while also being compliant with a health care provider's guidelines.

CHAPTER TWO

METHODS

Introduction

The purpose of this research paper was to identify the key components and efficacy of educational interventions for children with asthma. The method used to study this problem is presented in the following sections: (a) Design of the study, (b) Arrangements for conducting the study, and (c) Procedures of the study which includes the selection of peer reviewed journals, instrumentation, gathering data, and data analysis.

Design of the Study

A literature review was chosen for this study. This design was chosen because it allows the researcher to review data, summarize it, identify key findings, and make recommendations within a certain time period.

Arrangements for Conducting the Study

The researcher contacted the Ball State University reference librarians to find reliable and appropriate databases to search for educational interventions for children with asthma. The researcher chose to use *CINAHL [Cumulative Index to Nursing and Allied Health Literature], ERIC (EBSCOHost), Health Source: Nursing/Academic Edition, Medline (EBSCOHost), ProQuest Nursing and Allied Health Source, ProQuest Dissertations and These A& I, and Web of Science.* The databases chosen are health

related or educational based databases at Ball State University Libraries. The researcher and her advisor determined that the research paper would be written as four chapters: Chapter I, Introduction; Chapter II, Methods; Chapter III, Review of Literature and Results; and Chapter IV, Summary, Conclusions, and Recommendations. Institutional Review Board approval was not needed since there was no direct use of human subjects for data collection.

Procedures

The following procedures were used for the purpose of this study:

1) Selection of Educational Intervention Articles

The educational intervention articles selected for this study were identified by using key terms from seven databases coupled with "asthma" (Table 1). Table 1 illustrates how many educational intervention articles were located from each attempt. The following criteria were used to select educational interventions.

A. The year the article was published between 1990 and 2011.

B. The article related to the outcome variables that were studied: the key components of educational interventions, reduction of emergency room visits, or reduction of school absenteeism.

2) Instrumentation

The data collection instrument used in this study was a chart listing each key word and its results.

Instrument Items

The outcomes that were assessed for asthma self-management educational

interventions were determined by personal interest, looking at various sources, and seeing what information was readily available to study. The topics researched in this study were as follows: key components of asthma self-management educational interventions for children and reported efficacy of asthma self-management educational interventions that lead to reduced school absenteeism, and reported efficacy of asthma self-management educational interventions for children that lead to reduced emergency room visits.

Data Collection

The data collected was from reliable and appropriate databases as stated above. The researcher looked within these databases to find articles related to the determined listed outcomes stated above that related to asthma self-management educational interventions by first examining the articles' title and then the abstract. The common words or phrases found that related to asthma self-management educational interventions were: health education, asthma in children, pediatric respiratory diseases, self-efficacy, clinical trial, medicine research, asthmatics, education, patient education, self-management, impact, health, and health-care utilization.

Table 1 Number of Articles Made Available per Request

Author(s)	Educational Interventions*	"Educational Interventions"
CINAHL	2	
Dissertations and Theses		4
ERIC (EBSCOhost)	0	
Health Source	2	
Medline	0	
Web of Science	12	

Data Analysis

The self-management educational intervention articles collected from the selected databases were analyzed by the researcher using the following procedure: First, the researcher and her advisor created an analysis matrix. Second, the researcher read the article, summarized, and placed the summary within the matrix. Third, the researcher examined the matrix for themes that focused on key components and efficacy of self management of educational interventions for children with asthma. Relevant data was then organized to answer the research questions of this study.

CHAPTER THREE

REVIEW OF LITERATURE AND RESULTS

Introduction

The purpose of this research paper was to identify the key components and efficacy of educational interventions for self-management of asthma in children. In order to study this problem, a review of literature associated with educational interventions of a self-management of asthma for children was conducted. This chapter was divided into the following sections of related literature: (a) Asthma self-management guidelines, (b) The key components of asthma self-management educational interventions for children, (c) The reported efficacy of asthma self-management educational interventions for children in reducing school absenteeism, (d) The reported efficacy of asthma self-management educational interventions for children in reducing emergency room visits, (e) Description of studies using a matrix, and (f) Discussion of findings.

Asthma self-management guidelines

The goal of asthma self-management is to keep asthma manageable to reduce asthma exacerbations. The National Asthma Education and Prevention Program Expert Panel Report 3 have recommendations for successful asthma management. It separates asthma control into four components: 1) “Assessing and Monitoring Asthma Severity and

Asthma Control" (NHLBI, 2007, p. 15), 2) "Education for a Partnership in Care" (NHLBI, 2007, p. 18), 3) "Control of Environmental Factors and Comorbid Conditions That Affect Asthma"(NHLBI, 2007, p. 23), and 4) "Medications, using long-term daily medications and quick relief of acute symptoms and attacks to improve cost effectiveness and quality of life" (NHLBI, 2007, p. 28). Asthma self-management education can be categorized under component 2, "Education for a Partnership in Care" (NHLBI, 2007, p. 18) which is promoting asthma self-management skills for the patient to be self-sufficient. Self-management improves patient outcomes such as reduced emergency department visits, unplanned doctor visits, and reduced student absenteeism (NHLBI, 2007). Therefore, knowing the key components of educational interventions for self-management of asthma along with the efficacy of educational interventions for the self-management of asthma will help to improve the quality of life and health status of children and adolescents with asthma.

A Brief Overview of Asthma

Asthma is a respiratory disease (Centers for Disease Control and Prevention [CDC], 2009a). Asthma is characterized by narrowing or obstruction of the bronchial tubes or airways (Asthma and Allergy Foundation of America [AAFA], 2007a). The symptoms associated with asthma are chest tightness, wheezing, difficulty breathing, coughing, and mucus production (AAFA, 2007a & CDC, 2009a). The tissues of the airways are inflamed where large amounts of mucus may discharge into the airways, "and the smooth muscle surrounding the airways tightens… [also known] as bronchospasm" (AAFA, 2007a, p.2). The airways also become hyperresponsive or irritable (AAFA, 2007a).Treatment for asthma consists of quick relief and/or long-term control

medications depending on the severity of the asthma attack (CDC, 2009b). Medications used for asthma are bronchodilators and anti-inflammatory medications (AAFA, 2007a).

In 2009, 8.2% of the US population was affected by asthma (24.6 million people) (Akinbami, Moorman, & Liu, 2011). Children (ages 0-17 years old) make up 7.1 million of the population with asthma in the US (Akinbami et. al., 2011). Four million children with asthma have had at least one asthma attack in the previous year (Akinbami et. al., 2011). Out of the 12.8 million total that had exacerbations, children make up approximately 30% of this category (Akinbami et. al., 2011). Being in this group also makes an individual more susceptible to emergency room visits, chance of being hospitalized, or other adverse conditions (Akinbami et. al., 2011).

Asthma increased the most in the 1980's to late 1990's: The prevalence of asthma has recently increased so that from 2001 to 2009 the annual percentage of asthma increased 1.2% each year (Akinbami et. al., 2011). However, asthma attacks prevalence has remained constant from 3.9% to 4.3% from 1997-2009 (Akinbami et. al., 2011). Special populations of asthma should be examined because of the huge disparities between sub populations.

Children have a higher prevalence of asthma than adults (Akinbami et. al., 2011). Overall, women have a higher prevalence of asthma than men, but in children, boys have a higher prevalence than girls until adolescence, when females begin to have a higher prevalence of asthma (Akinbami et. al., 2011). In minority groups, African Americans have a higher rate of asthma than whites (Akinbami et. al., 2011). In the US, Puerto

Ricans have a higher prevalence of asthma in comparison to non-Hispanic white or non-Hispanic black individuals (Akinbami et. al., 2011). Some of the other characteristics associated with groups with a higher prevalence of asthma are being poor (household income less than the federal poverty line) or near poor and living in the Northeastern and Midwestern areas of the US (Akinbami et. al., 2011).

Barnett and Nurmagambetov (2011) estimated that the total incremental cost for asthma between 2002 and 2007 was $3,259 per person per year. The incremental cost for emergency room visits per person was $110, and the cost for inpatient visits per person was $446 (Barnett & Nurmagambetou, 2011). Medications makeup the biggest cost for asthma at $1680 per person per year (Barnett & Nurmagambetou, 2011). In regards to student absenteeism due to asthma, it has accounted for 98% additional days missed from school (Barnett & Nurmagambetou, 2011). The total cost for the burden of asthma on society in 2007 was $56 billion (Barnett & Nurmagambetou, 2011). The cost of asthma to society is overwhelming and emphasizes the need for research in this area to reduce the burden and economic cost of asthma on society.

The key components of asthma self-management educational interventions

For the evaluation of the key components of an asthma self-management educational intervention for children, all studies found in the literature review available were used.

Asthma Self-Management educational intervention and Home-based setting

Georgiou et al. (2003) did a longitudinal study using pre and post test design to analyze data. A major health insurance company (UnitedHealthcare) did an area wide

study from 17 of its regions (it did not state which regions) for all of its members who met their criteria using members with asthma from 5 to 17 years old and their caregivers. UnitedHealthcare sent out baseline surveys to a randomized sample from each region examined. Afterwards, all qualified members got educational materials on asthma and seasonal or quarterly mailings. Respondents to the surveys got tool kits (peak flow meter and video) along with high-risk asthma members; and current high needs responders also were offered telephonic case management support. The program was monitored for a year and a follow-up survey was sent out. There was a 28% response rate from the follow-up survey. The majority of respondents stated they participated in one or more of the interventions given to them. There was a statistically significant difference in the quality of life measures which included reduction in emergency room visits (9.7% to 5.5%) and school absenteeism (36% to 23%). Other significant differences that were found were caregivers' improvement on asthma management skills and less work days missed for caregivers. Since caregivers were able to decrease their missed days at work, on average their reduction of missed pay went from $619 to $292 after a year of participating in the intervention. This intervention was shown to be effective in making positive changes after asthma self-management care.

Otsuki et al. (2009) conducted an urban study where the majority of the subjects were male (62%) and black (98%) in Baltimore, Maryland. The average age of participants was 7 years old and the sample size was 250. Otsuki et al. (2009) administered two interventions for this study. One was a home-based asthma education

program and another was a home-based asthma education program plus medicine adherence program. The home-based asthma education group received five home visits by asthma educators and the education-plus group received the same amount of home visits along with related training on medication adherence. The control group received a booklet and resource guide that all groups received and all the groups were encouraged to use their primary care providers. The results showed that all three groups had decreased asthma morbidity. All three groups had a 33% decrease ($p<.001$) every six months on emergency room visits. However, when the two intervention groups are combined in comparison to the control group, the decrease of emergency room visits was greater. There was a 12% - 17% greater decrease every six months for emergency room visits for the combined intervention groups in comparison to the control group. The use of an asthma education-plus medicine adherence program did not show significant differences from the asthma-education only program. Therefore, Otsuki et al. (2009) suggested that using asthma education plus medication adherence intervention yielded mixed results and cannot be recommended to use in the future.

Guendelman and colleagues (2002) did a randomized control trial of urban youth where over 90% were Medicaid recipients, over 50% were black, and the median age of the subjects was 12 years old. The study took place in Oakland, California where a computerized portable device was used as a tracking mechanism for children with asthma, subjects were responsible for answering questions in regards to asthma self-management and education on their portable devices each day. Subsequently, a nurse

coordinator retrieved the downloaded information. The control group was given a diary to keep track of their asthma management. The results of the study showed initially (at a six weeks follow-up visit) the intervention group had significantly less asthma control problems in comparison to the control group, but the change did not last. Overtime, there were no significant differences found in asthma control problems between the two groups. In fact, there was an increase in hospitalizations for both groups, as asthma control problems increased overtime. At the initial follow-up at six weeks it was self-reported that 70% of the children were using the portable monitoring device with no or few reminders in comparison to 49% of children from the control group who used their diary with few or no reminders. However, as time went on both groups showed less compliance in using the self monitoring devices and at the 12 weeks follow-up, there was no statistically significant difference in using either monitoring device, although the use of the intervention monitoring device had a higher compliance rate overall, than the control group. Guendelman et al. (2002) pointed out that the intervention encouraged children to perform asthma self-management initially which may be useful to have at a critical point such as initial diagnosis or after an emergency department visit. The cost effectiveness of this device was not analyzed.

Kamps et al. (2008) used a psychoeducational intervention. The intervention group got standard-of-care plus adherence improvement strategies. The standard care was also given to the control group. The standard of care consisted of weekly sessions by a licensed psychologist or a master level graduate student, asthma education, relaxation,

coping techniques for stress management, and asthma-management skills. There were no statistically significant differences found for outcomes measured, except the intervention group improved their adherence rate (16.83%) to corticosteroids (anti-inflammatory long-term controlling medication, NHBLI, 2007) during the intervention period. However, the change did not last after the intervention. Kamps et al. (2008) suggested that having regular contact with a healthcare provider or having a partnership in care is essential to ensure success of an asthma self- management program. The Expert Panel Report 3 also recommended regular contact with a healthcare provider for a partnership in care in the second key component for successful asthma self-management (NHBL, 2007).

Williams et al. (2006) and Levy and colleagues (2006) conducted environmental home-based asthma self-management educational interventions. Williams et al. (2006) combined asthma education and reducing environmental factors to asthma by focusing on the reducing personal allergens and related asthma education and the control group received a delayed intervention. Levy et al. (2006) focused on integrated pest management (IPM) guidelines along with related education given and limited case management by a community health nurse. The program recruited subjects using lay people within the community and they implemented the intervention. This study was considered a longitudinal community-based participatory research study in which the community is empowered to make changes within their neighborhoods. In Williams et al. (2006), a sample of 161 children completed the study with a median age of 8 years old. The intervention group showed significantly less dust mites compared to the control

group. However, there was a significant reduction in cockroach allergens at 4 and 8 months, but not at 12 months. The Levy et al. (2006) study used children from three public housing units and the results fluctuated between housing units. However, the quality of life improved significantly for the whole sample and the cockroach allergens were greatly reduced. Williams et al. (2006) had a lack of stable reduction of cockroach allergens in their study and found no reduction of asthma symptoms. Levy et al. (2006) also indicated that improvement in social support may relate to respiratory health improvement such as the use of lay community health advocates in their intervention.

Asthma Self-Management educational intervention and Clinic setting

Two articles were found using asthma self-management educational intervention in a clinical setting. The first, Hendricson et al. (1996) reported an evaluation of a pediatric clinic-based program. The intervention was centered on self-management skills and taking small steps to change using culturally appropriate material. The average age of the subjects was 10.2 years. The majority of the subjects were Hispanic (79%). Also, 71% of the Hispanic subjects' annual household income was less than $12, 000. The intervention spent as much time as possible with the child and reinforced information with the parents. It was reported that 100% of the parents favored the program and nurse educator, over 90% of the 6-12-year-olds favored the program, 94% of teenagers favored the program, and 100% of teenagers favored the nurse educator. There was a 92% completion rate of the program and 73% of the population self-reported that the intervention made an impact on their asthma self-management behaviors. The study not

only provided educational information, but also used behavior change techniques. The study used subjective evaluation, attrition rate, and one year follow-up data to measure the success of the study. There was no comparison group. Hendricson et al. (1996) suggested making sure materials used in an intervention are culturally and linguistically age appropriate, items are easy to understand, field test products, and go over a few key points with application.

The second study by Homer et al. (2000) sampled urban youth, and the average age for the study was 7.4 years. Majority of the subjects were blacks (60.5%) and it used an asthma education computer game as intervention. The intervention group had three sessions to play an asthma game while the control group read asthma books and played a non-asthma video game. The results showed statistically significant increment in asthma knowledge only in the intervention group. Limited asthma education was also given to the control group. Also, less than one-third of the intervention group completed two sessions. Homer et al. (2000) recommended using this intervention along with a comprehensive self-care program.

Asthma Self-Management educational intervention and School-based setting

Magzamen and colleagues (2008) conducted an evaluation for an urban school-based program over three academic school years. The number of participants in the study was 990. The ages of participants were not listed, but the subjects were sixth to twelfth graders and a significant number of the participants were sixth graders compared to the number of eligible students. The school-based program consisted of four group sessions

led by an asthma nurse. In comparison, from baseline to follow-up questionnaires, the study showed that there was a significant decrease in school absenteeism, nights of sleep disruption, reduction of activity limitation, and emergency room visits or hospitalizations for the first three years of the intervention. Peak flow meters and spacers (a tool to use an inhaler properly, AAFA, 2007b) were both available as product interventions for the first two school years of the intervention. School absenteeism decreased significantly in the first two school years for participants in comparing baseline to follow-up data. As well as, nights of sleep interruption was significantly less in comparing baseline to follow-up questionnaires for the first two school years. However, physical activity restriction was significantly less for all three school years in comparison to baseline to follow-up questionnaires. The odds are higher for reduction in emergency room visits or hospitalizations for all three academic years in comparison to baseline to follow-up data. The odds were higher for peak flow meter and spacer usage in odds of improvement for frequency of symptoms for the first two school years, but the odds of improvement of symptoms with peak flow meter usage in the third school year did not show a change in improvement from baseline to follow-up. The study did not use a control, comparison group, or randomization.

The reported efficacy of asthma self-management educational interventions for children in reducing school absenteeism

School absenteeism was tested in studies both by Homer et al. (2000) and Guendelman et al. (2002). Both studies targeted urban youth and used computer-based

interventions, and the majority of the subjects were African American. Some distinct differences in the study were the age groups: Homer et al. (2000) had younger subjects (the mean age was 7.4 years) and Guendelman et al. (2002) had older children (the mean age was 12 years). The studies were able to find out some insights such as possibly being able to use Homer et al. (2000) intervention along with a comprehensive asthma self-management program. Guendelman et al. (2002) suggested their device could be used at a critical time when monitoring is needed, such as after an emergency room visit. Despite the similarities in each study, there was no statistically significant difference for school absenteeism using the randomized controlled trial methods.

The reported efficacy of asthma self-management educational interventions for children in reducing emergency room visits

Four interventions were reviewed to check the efficacy of asthma self-management educational interventions for children in reducing emergency room visits. The first study by Otsuki et al. (2009), was conducted with subjects (n= 250) from the emergency department visits and hospitalizations for asthma. This study had the unique feature of having two interventions in their study. The resource guide made up of various community resources was a unique feature to the study which included community resources that helped to meet the total needs of a person to ensure adherence. The study did suggest, depending on the target audience worked with, that it may be more beneficial to meet more of the total needs of a person than only one area to gain adherence to an intervention. There was a significant reduction in emergency room visits for only the

education-plus adherence intervention group, but because there were inconsistencies the authors would not recommend this intervention to be used in the future.

Guendelman et al. (2002) did a study in Oakland, California where a computerized portable device was used as a tracking mechanism for children with asthma as aforementioned. The outcome of emergency room visits was also measured during this intervention. There were no significant changes in emergency room visits as a result of this study. However, the study showed self monitoring using a computerized device or a diary can be of help in the self-management of asthma for children. The study suggested that the small population size and length of the study may have been the reasoning for no significant changes.

Homer et al. (2000) also measured the outcome of emergency room visits reduction. The computer game intervention did show significant increase in asthma knowledge, which can be helpful in asthma self-management; however, no behavior or outcome changes were observed, such as reduction of emergency room visits.

Finally, Williams et al. (2006) had an interesting dynamic to their intervention not only including asthma education, but also an environmental intervention like Levy et al. (2006). Williams et al. (2006) failed to show statically significant reduction in emergency room visits from the study. The study also suggested more work is needed in this area to know who would benefit from such an intervention.

Data Supporting Research Questions

The purpose of this research paper was to identify the key components and

efficacy of educational interventions for self-management of asthma in children. The first research question was about the key components of asthma self-management educational interventions for children. To answer this question, the researcher's literature review was organized within a matrix (Table 2).

Table 2 Analysis of Information Obtained Regarding the Key Components of Asthma Self-Management Educational Interventions for Children

Author(s)	Design	Sample Size/ Age Range	Intervention(s)	Results
Georgiou et al, 2003	Longitudinal study	401/ 5-13	Home-based asthma self-management via printed material, peak flow meter, and telephonic support	Participants were given one or more interventions; significant differences in quality of life measures; significant changes in caregivers' improvement on asthma management skills, and less work days missed
Otsukie et al, 2009	Randomized Control Trial	250/ 2-12	Home-based asthma education and home-based asthma education plus medication adherence therapy	All groups had significant reduction in asthma morbidity; two intervention groups' combined results compared with control group had greater outputs than they would have separately.
Guendelman et al, 2002	Randomized Control Trial	134/ 8-16	Home-based computerized portable device for asthma education and self-management	Initially intervention group showed significantly lesser asthma control problems, but changes did not last; no group differences in ER visits; initial compliance for device from intervention group; less compliance from both groups towards the end of study
Kamps et al, 2008	Randomized Control Trial	15/ 7-12	Home-based psychoeducational intervention	Intervention group improved adherence rate to inhaled corticosteroids (16.83%), but the change did not last after the intervention; no other significant differences were found between groups
Williams et al, 2006	Randomized Control Trial	410/ 5-12	Home-based asthma education and environmental intervention	Intervention group had significantly fewer dust mite allergens; control group had increasing amount of dust mite allergens; Cockroach allergens reduction short-lived, but did not last after 12 months follow-up
Levy et al, 2006	Longitudinal community participatory study	78/ 4-17	Home-based environmental intervention used IPM, related education, and limited nurse case management	Mixed results from housing units; quality of life improved significantly for all groups; cockroach allergen was greatly reduced
Hendricson et al, 1996	Evaluation	73/ 6-16	Asthma self-management skills using social behavior theory to take small steps to change at a local clinic	Highly satisfied subjects and parents; intervention was perceived helpful in asthma self-management by 73% of parents.
Homer et al, 2000	Randomized Control Trial	137/ 3-12	Asthma education computer game at a primary care facility	Significant difference in asthma knowledge only between the control and experiment groups.
Magzamen et al, 2008	Evaluation	990/ Unlisted	School-based asthma education program	Significant differences from baseline to follow-up surveys in 1st 2 years; third-year results changed; less restriction on activities did not change but stayed significant in all 3 years

Nine studies were examined to find the key components of asthma self-management educational interventions for children. Of the nine studies, seven had positive impact from intervention(s) that lasted after the intervention(s) was over. The studies varied in results, each study had its own unique characteristics and similarities. Some of the similarities of the studies noted were from, six of the seven (86%) studies that were impactful: the subjects were from a minority group, poor, and urban dwellers. Of the subjects that had participants primarily from a minority group, four of the seven studies (57%) were conducted with African Americans, and African Americans made up almost 99% of the sample populations of those studies. Half of the impactful studies were conducted in the Northeastern US. Other similarities of the studies were: four of seven (57%) impactful studies had over 100 subjects in their sample size, were home-based interventions with a range of components from reduction of environmental factors to provision of asthma support from a remote location, and the majority of the impactful studies were randomized controlled trials.

Georgiou et al. (2003) found that equipping the program participants with adequate tools for self-management (i.e. peak flow meter, printed material, and telephone support) had a positive impact on children with asthma and their caregivers. Otsukie et al. (2009) found teaching asthma self-management skills only or adding behavior modification skills that focused on medication adherence to teaching asthma self-management skills both made a difference in changing the asthma self-management behaviors. Homer et al. (2000) found using a computer-based product (video game) improved asthma knowledge, but not other variables. Williams et al. (2006) found that their environmental intervention reduced dust mite allergens, but not cockroach allergens (and caused no

change in asthma severity), while Levy et al. (2006) found their environmental intervention reduced cockroach allergens, but not dust mite allergens using IPM (however, other areas of self-management skills did not change). Hendricson et al. (1996) found making culturally relevant material and allowing subjects to make small steps to change their asthma management routine was extremely successful. Magzamen et al. (2008) reported that a school-based program can positively impact a child's asthma self-management care.

Research question two asked the reported efficacy of asthma self-management educational interventions for children in reducing school absenteeism. The use of a matrix to organize these results is found in Table 3.

Table 3 Analysis of Information Obtained Regarding the Reported Efficacy of Asthma Self-Management Educational Interventions for Children in Reducing School. Absenteeism.

Author(s)	Design	Sample Size/ Age Range	Intervention(s)	Results
Homer et al., 2000	Randomized Control Trial	137/ 3-12	Asthma education computer game at a primary care facility	Significant difference in asthma knowledge only between the control and experiment groups.
Guendelman et al., 2002	Randomized Control Trial	134/ 8-16	Home-based computerized portable device for asthma education and self-management	Initially intervention group showed significantly lesser asthma control problems, but changes did not last; no group differences in emergency room visits or hospitalizations; initial compliance for device from intervention group; less compliance from both groups towards the end of study

Two studies (see table 3) that examined the efficacy of asthma self-management educational interventions for children in reducing school absenteeism were also reviewed. Of the two studies, none indicated a significant difference in the reduction of school absenteeism from the comparison groups. Significant differences were found between the control and experiment groups in other areas, but not in the variable examined. Further research is needed to determine the efficacy of asthma self-management educational interventions for children in reducing school absenteeism.

Research question three asked reported efficacy of asthma self-management educational interventions for children in reducing emergency room visits. The use of a matrix to organize these results is found in Table 4.

Table 4 Analysis of Information Obtained Regarding the Reported Efficacy of Asthma Self-Management Educational Interventions for Children in Reducing Emergency Room (ER) Visits.

Author(s)	Design	Sample Size/ Age Range	Intervention(s)	Results
Otsukie et al., 2009 (p. 14)	Randomized Control Trial	250/ 2-12	Home-based asthma education and asthma education plus medication adherence	All three groups had decreased asthma morbidity and had a 33% decrease in ER visits per six months; education plus adherence group's ER visits decreased faster than control group; education only group had no difference in ER visits than control group, combined experiment groups had faster ER visits decrease than control group; experiment groups combined resulted in greater outputs than control group
Guendelman et al., 2002 (p. 14)	Randomized Control Trial	134/ 8-16	Home-based computerized portable device for asthma education and self-management	Initially intervention group showed significantly lesser asthma control problems, but changes did not last; no group differences in emergency room visits or hospitalizations; initial compliance for device from intervention group; less compliance from both groups towards the end of study
Homer et al., 2000 (p.14)	Randomized Control Trial	137/ 3-12	Asthma education computer game at a primary care facility	Significant difference in asthma knowledge only between the control and experiment groups.
Williams et al., 2006 (p.9)	Randomized Control Trial	410/ 5-12	Home-based asthma education and environmental intervention	Intervention group had significantly less dust mite allergens than control group; control group showed increased amount of dust mites allergens; Cockroach allergens reduction was not sustained. Asthma severity score did not show a significant difference between the control and experiment groups.

The researcher identified four studies that examined the efficacy of asthma self-management educational interventions for children in reducing emergency room visits. Of the four studies, one study (Otsukie et al., 2009) had significant difference in the reduction of emergency room visits in all three comparison groups. Otsukie et al. (2009) had two interventions (asthma education and asthma education plus adherence group) and a control group. All three groups in Otsukie et al. (2009) study had a 33% decrease in emergency room visits every six months ($p < .001$): on comparing asthma education plus adherence group to the comparison group, there was a 15% decrease in emergency room visits per six months ($p=.02$). Also, looking at both experiment groups combined in comparison to the control group, emergency room visits reduction had a significant difference ($p=.03$) along with the use of oral steroids (a quick relief medication, NHBLI, 2007, p. 52) by 12% - 17% every six months. The other studies did not find a significant difference in the reduction of emergency room visits between the control and experiment groups. Guendelman et al. (2002) had an increase in hospital admissions as the study progressed and there were also asthma symptoms worsened in their study.

Discussion of Findings

Most studies used in this research project used baseline data, measured it, before and after the intervention, did an analysis, posted results, and discussed them. There were a wide variety of research designs used, with randomized control trials being the most common one. There were strengths and weaknesses to each study. One consistency with each study is that each study was reducing the burden of asthma in children through various interventions.

In answering the first research question regarding the key components of asthma self-

management educational interventions for children, of the studies that had at least one positive lasting impact on the burden of asthma (Georgiou et al., 2003; Otsukie et al., 2009; Williams et al., 2006; Levy et al, 2006; Hendricson et al., 1996; Homer et al., 2000; & Magzamen et al., 2008) each had its own strengths and weaknesses which makes it difficult to specify a consistent theme from each study. The key components found in each study were: being comprehensive, going beyond asthma self-management skills, but providing community resources to take care of the whole person, making the study accessible to the study population, such as sending information to the subjects' residences, providing telephonic support, having an intervention during lunchtime at a child's school, social support such as community support and participation, culturally relevant material, addressing belief systems, keeping the attention of the subject or providing motivation to want to do the asthma self-management, using a strategy such as PIM, and reducing environmental factors. Although, many key components were found to help to ensure efficacy in asthma self management not all studies should be treated equally. The various methods and measurements used in each study were not the same. Of the seven studies that were found to be impactful in at least one area to reduce the burden of asthma: three were randomized controlled trials; two were longitudinal studies; and two were research evaluation studies. Also, statistical analysis was not done in each study, and some results were based on self-report data only. Although, the mean of the sample populations of the seven studies were 334 the range was 917 with the smallest sample size was 73 and largest one 990.

In answering research question two that asked the reported efficacy of asthma self-management educational interventions for children in reducing school absenteeism. Data was limited in answering this question due to the small number of randomized controlled studies found on this subject. Farther research is needed in order to properly examine this question. Finally, addressing the last research question reported efficacy of asthma self-management educational interventions for children in reducing emergency room visits. There was only one study found that could answer this question which makes it hard to generalize results. However the study by Otuski et al. (2009) had a comprehensive program, encouraged participants to continue to see primary care physician, did home visits led by an asthma educator. Although the study did not produce the desired primary results, it did show that there was a significant change in emergency room visits. More research is needed to answer the research question.

Discussion of Limitations

As with all studies, there are limitations to the research in this research project using Ball State University library services limited the availability of articles available to include in the literature review. Furthermore, choosing to answer research question two and three with randomized controlled studies limited the amount of articles that could be found with the search terms used. Also, the researcher relied on other researchers' studies to determine that the research questions would be addressed properly. The study population varied in sizes with a study population as large as 990, while the rest of the studies were approximately 400 subjects for a study population or less. Also, the

researcher desired to look at current studies within the past 20 years some studies were removed that may have been relevant since asthma is common childhood disease. Another limitation to be noted is the use of US-based and English journals limited the number of journals that could be used in the study. Also incorrect search words could have been chosen to search for articles. Finally, eliminating children outside of 2 to 17 years old and studies that focused on other comorbidities limited the results, too.

CHAPTER FOUR

Summary, Findings, and Conclusions

Summary

The purpose of this research paper was to identify key components and the efficacy of educational interventions for children with asthma. A literature review was used to identify these components. The literature review was analyzed using a matrix developed by both the researcher and her advisor.

Findings

The analysis of data revealed the following major findings:

1. Due to sample sizes and the wide variety of survey designs it was hard to compare studies.
2. The studies showing reduction in school absenteeism and emergency room visits using random control trials are limited.
3. The smaller samples and non statistical analysis made it difficult to generalize the studied population.

Conclusions

On the basis of the findings paired with the limitations of the study stated, the conclusions that can be drawn are as follows:

1. The profession lacks the consistency of evidence-based literature that strongly supports
2. The key components of asthma self-management.
3. The profession lacks the support of strong evidence-based literature that shows reduction in school absenteeism and emergency room visits from children with asthma.

Recommendations for Additional Research

The following recommendations can be made for future health science research with regards to the key components of asthma self-management educational interventions; the efficacy of asthma self-management educational interventions for reduction in school absenteeism; and the efficacy of asthma self-management educational interventions for emergency room visits.

1. Scientific design methods are needed to properly report the key components of asthma self-management educational interventions.
2. Additional randomized control trials are needed to show reduction in school absenteeism and emergency room visit for children with asthma.

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